Section 8

Cumulative Effects

Under federal guidelines, a biological evaluation must describe and analyze the effects of actions that are cumulative to the primary action.[1] For this Seattle Biological Evaluation, 'cumulative effects' are the effects of future local, state or private activities that are reasonably certain to occur within the Seattle action areas (see Figure 1).

Federal actions are not included in the cumulative effects analysis because the effects of those actions would be considered in any future Section 7 consultations. This cumulative effects analysis does not address future work within the Seattle action areas that would be authorized by a federal agency (e.g., work requiring a Corps Section 10 or 404 permit), funded by a federal agency (e.g., projects receiving funding from the Federal Highway Administration, U.S. Department of Housing and Urban Development, etc.), or carried out by a federal agency (e.g., Corps' modification of the Hiram M. Chittenden Locks).

Cumulative effects within the 7 action areas for the Seattle Biological Evaluation may include impacts from the following:

- Expansion of transportation networks that may result in environmental impacts.
- Increases in population growth that may result in increases in impervious surfaces, contaminant releases, and pesticide use and subsequent releases.
- Along the Puget Sound waterfront, increases in water-based actions, water-based businesses and waterfront businesses (such as barge shipping, fishing, cement production, shipbuilding and repair, marine construction, aircraft manufacturing, sand and gravel operations, and recreational boating) that may result in environmental impacts.
- Global and regional changes to climate that may cause variations in environmental impacts.

[1] Cumulative effects are impacts on the environment that result from the incremental impact of future actions when added to other past, present, and reasonably foreseeable future actions regardless of which agency or person undertakes the action.

All these activities—which may have an incremental impact and/or compounding effect when experienced together—may result in impacts to ESA-listed fish and wildlife species.

Expansion of the transportation network within the Seattle action areas has the potential to increase impervious surface and may also impact land use. The following are direct and indirect effects resulting from these cumulative actions:

- Increased sedimentation, increased surface water peak flows, reduced groundwater flows to receiving waters ,and increased impervious surface.
- Loss or further degradation of functional riparian habitats.
- Increased noise and human activity in areas used by foraging, wintering, and nesting bald eagles.

These effects may be lessened by the application of updated regulatory regimes that focus on protecting riparian areas and controlling the harmful effects of erosion and drainage during construction.

Current population within the City of Seattle is about 563,000. In the next 20 years, the population is projected to increase about 17.5% or by 98,700 residents (City of Seattle 2005). Population increases may result in changing impervious surfaces through construction of more buildings and paved or concreted surfaces. A related potential impact is the pressure to move the urban growth boundary as a result of increased housing costs. The political will to hold to the urban growth boundary will be important in focusing greater impacts on the City of Seattle rather than sprawl into the rural areas. While holding to the current urban growth boundary will provide better ecological functioning overall, it puts added pressure on the urban areas and requires increased emphasis on the protection of water quality and riparian and aquatic habitat.

Development increases impervious surfaces. Most physical, chemical, and biological characteristics of stream quality were found to degrade with more impervious surfaces (May et al.1996). The effect of increases in impervious surfaces can result in higher peaks in water flow during rains and less infiltration to ground water, resulting in lower groundwater flows to waterbodies during dry periods. It also may increase the quantity of pollutants entering surface waterbodies instead of being filtered by the soils during infiltration. The City of Seattle is already highly urbanized and little new impervious surface can be built. Nonetheless, updated land-use regulations, building standards, and construction regulations help minimize or mitigate adverse impacts to critical areas through prohibiting actions or by dictating timing and methods of an action. Increased residential and commercial development also may result in increased use of chemical fertilizers or pesticides, which can enter Puget Sound, Lake Washington, and streams within the 7 action areas. Outreach and education programs conducted by local governments and utilities may be effective at minimizing this increase. In addition, the Seattle Mayor now has an Environmental Action Agenda that includes protection and improvements to surface water quality and Seattle's aquatic habitats.

The action areas along Puget Sound are major urban industrial waterways that support water-based commerce, waterfront businesses and water transportation networks, such as marine container and barge shipping, fishing, rail and highway transportation, concrete production, shipbuilding and repair, marine construction, aircraft manufacturing, sand and gravel operations, and recreational boating, to name a few. The Puget Sound shoreline is continually changing as new waterfront facilities and uses occur. The increased operation of the waterway's facilities may increase the use of the water-based transportation network and its connection to the land-based transportation network. Puget Sound contains several onshore oil facilities, tanker ports receiving large numbers of tanker and barge trips annually, large industrial developments, tanker and other shipping routes, bypass traffic into southern British Columbia, and other coastal and urban developments. The increase in vessel traffic will increase the potential for water pollution from vessel-related activities (e.g., oil, transmission fluid, gasoline, and diesel fuel spills).

Regulation by agencies, such as the Washington State Department of Ecology and the U.S. Coast Guard, mitigate or minimize adverse effects to water quality, including those caused by vessels operating in Puget Sound. For example, regulations prohibit bilge and sewage discharge and require that any hazardous material spilled (e.g., diesel fuel, gasoline, oil, and transmission fluid) be reported to Ecology and the Coast Guard.

Lately it has become important to consider global climate change as a possible component of cumulative effects. The Seattle Mayor has introduced locally and nationally a Climate Protection Initiative to reduce global warming, improve air quality, and review the rise in sea-level and its potential and effects. Locally, there have been increases in the number of days of warm temperatures in some surface waters, such as in the Ship Canal. In addition, rainfall frequency and intensity may be impacted by global climate change. These changes may carry incremental environmental impacts, such as affecting the timing of salmon migration and survival or reproductive viability.

The City of Seattle is taking numerous actions to offset adverse cumulative effects and to benefit the environment. One such action is to promote healthy people and communities by creating healthy livable urban centers and promoting sustainable practices. In addition the Mayor has established the Green Seattle Initiative for restoring the urban forest, increasing open space, and promoting the greening of the 'built environment.' Other offsetting actions for adverse effects to growth include:

- Increasingly well-informed and targeted regulations
- Educating citizens
- Creating environmentally-friendly areas.

Local, state, and federal regulators are striving to develop effective regulations and guidelines, such as Environmental Critical Area ordinances, to mitigate for development. Included in this effort is Seattle's Shoreline Master Program with its revised Environmental Critical Area ordinance. Many agencies and nonprofit groups are

educating citizens on topics such as using environmentally-friendly products, planting native vegetation, and removing invasive plants, car-pooling, mass transit, biking, walking, and creating and improving fish and wildlife habitats. Environmentally-friendly trends include construction of more natural surface water drainage systems through designs that allow longer surface water contact with the soil and, thus, more infiltration and pollutant soil filtering. Other actions include removal of stream blockages and the restoration of stream, lake, and Puget Sound shorelines to benefit salmon and other riparian and aquatic species. While many of these actions will require permitting with the Corps and, therefore, consultation with the Services, they will help avoid and minimize the cumulative effects of ongoing activities within the Seattle action areas.